"Deconstructing Episodic Memory with Construction" (2007) by Demis Hassabis and Eleanor Maguire

Link to Actual Paper

1. The brain network supporting the recall of episodic memories shares much in common with other cognitive functions such as
2. …episodic future thinking, navigation, and theory of mind
3. Theory of mind as a cognitive function is perspective taking… it's modeling the mental state and intentions of others
4. We argue that "scene construction" rather than "self-projection" is the key common process supporting recollective experiences …
5. … and in vividly imagining fictitious experiences.
6. Episodic memory is the memory for our everyday personal experiences.
7. Tulving's 3 key properties of the recall of episodic memories: a subjective sense of time (mental time travel), connection to the self, autonoetic consciousness
8. Autonoetic consciousness is the capacity to recursively introspect on one's own subjective experience through time, that is, to perceive the continuity in one's identity from the past, to the present, and into the future.
9. After Tulving, others have identified further properties of episodic memory recall including: feelings of familiarity, retrieval of semantic information, narrative structure, and visual imagery
10. Buckner and Carol describe "self-projection" as the ability to shift perspective from the immediate present to alternative perspectives, requiring a shift in perception from the immediate environment to the alternative, imagined future environment referenced to oneself.
11. Scene construction: the process of mentally generating and maintaining a complex and coherent scene or event
12. This is achieved by the retrieval and integration of relevant informational components stored in their modality-specific cortical areas…
13. The product of which has a coherent spatial context and can then later be manipulated and visualized.
14. The recall of episodic memories is a (re)constructive process rather than an all-or-nothing retrieval of a perfect 'holistic' record.
15. Imagination as a cognitive function is defined roughly as the vivid imagining of fictitious experience that is not explicitly temporal in nature and that is not necessarily self-relevant or even possible.
16. A purely created imaginary experience would not have the same reliance or effect on the imaginer's self-concept compared with a real episodic memory.
17. Familiarity is defined as the subjective feeling or judgment of oldness

18. Self is defined as processes reliant on or affecting the concept of oneself and thereby having a direct connection to or influence over our self-perception

19. Scene construction provides the stage on which the remembered event is played, or the 'where' for the 'what' to occur in using Tulving's 'what, where, when' taxonomy of episodic memory.

20. How does the machinery that supports scene construction relate to that which supports scene perception? And what's the role of emotion?

21. To what extent do animals have the abilities that characterize episodic memory?

22. Different cognitive functions call on combinations of different component processes depending on the nature of the content and the goal to be achieved.

23. … with episodic memory, arguably the most complex of these functions recruiting all of these processes and, thus, sitting at the apex of this group.

24. Damaging any of its operating components will impair any cognitive functions relying on that process.

25. This is why episodic memory appears to be more vulnerable than other memory systems.

26. New paradigms will be needed to make progress in further disambiguating the myriad of component processes that underlie episodic memory.

27. To this end, we've demonstrated as a tool the novel task of vividly imagining fictitious experiences

28. Constructive processes: the ability to put informational components together in novel ways in the service of a goal.

29. If constructive processes underlie episodic memory and many other related high-level cognitive functions, what, if any, evolutionary advantages does this confer?

30. From a computational perspective, reconstructing a memory from its components is more efficient in terms of storage capacity than the alternative of storing each memory separately as an intact record.

31. This kind of storage structure lends itself conveniently to making abstraction and generalization inferences across distinct experiences.

32. Did episodic memory evolve as the ultimate expression of the combination of these underlying processes?

33. Or, were these underlying processes developed to support episodic memory and were then later co-opted for use by other functions?

34. Consider an organism that, in their present situation, is confronted by several choices of what to do next.

35. Being able to accurately and richly mentally simulate or construct what these possible future states might be like, before making the decision,...

36. Would aid both the evaluation of the desirability of those outcomes and the planning processes needed to make them happen.

37. Construction forms the basis of imagination and possibly creativity.

38. Some animals do possess at least some constructive episodic capabilities.

39. Scrub Jays, which are a type of bird, intelligently and flexibly cache food for future consumption and display impressive 'causal reasoning, imagination, and prospection abilities.'
40. The complexity of the constructive episodic memory system and its underlying processes might explain its flexibility, vulnerability, and its relatively late development, …
41. … only becoming fully operational in humans at the age of about 4 years.